Evaluation of trend and mortality pattern of communicable diseases in a teaching institution in Kerala

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ABSTRACT

Context: Even in this era of epidemiologic transition communicable disease is still a major public health problem. Surveillance and timely prevention and control activities are the key to the reduction of morbidity and mortality of communicable diseases. Identifying the trend in communicable diseases and pattern of mortality for a period of ten years will be an insight into the ongoing surveillance. **Aim:** In this study we have analysed data from 2013 to 2022 to evaluate the trend and mortality pattern of communicable diseases in a teaching institution in Kerala. **Settings and Design:** A retrospective record-based cross-sectional study conducted at the Department of Community Medicine, Government Medical College, Kottayam. **Methods and Material:** All confirmed communicable disease cases reported from 2013 to 2022 were included in this study except COVID-19-positive cases. The communicable diseases were grouped as: airborne, waterborne, vector-borne, zoonosis, bloodborne diseases and others. SPSS version 20.0 software, Microsoft Word, and Excel were used in data handling and analysis. **Results:** Total cases reported were 48124. The majority of the morbidity was due to airborne diseases (17585,37%) followed by waterborne diseases (6381, 13%). The total number of deaths reported was 1842. Airborne and zoonotic diseases together accounted for more than 50% of the mortality. Case fatality rate of zoonosis (20.2%) was the highest followed by bloodborne diseases (10.2%). **Conclusions:** Communicable diseases still continue as a public health problem contributing to morbidity and mortality. Airborne diseases and zoonotic diseases constitute the maximum mortality.

Keywords: Airborne diseases, communicable diseases, trend

Introduction

A communicable disease is one that spreads from person to person, animal to human, or surface to person. These diseases are caused by pathogens such as viruses, bacteria, and fungus. Communicable diseases can be spread through body fluids, insect bites, contaminated surfaces, water, and foods, or through the air. During the early twentieth century, the proportion of infectious diseases was trending downward as a result of improved living conditions, increased access to health care, including better vaccinations, the introduction of antibiotics, and improved public health surveillance and monitoring. However, there has been an increase in the appearance and re-emergence of infectious diseases in many parts of the world.

In 2019, there were 3 million deaths and 30 million years of healthy life lost to disability (as measured by YLDs), corresponding to 288·4 million DALYs from communicable diseases among children and adolescents globally (57·3% of total communicable disease burden across all ages).[1] According to WHO in low-income nations and marginalized communities, communicable diseases such as HIV/AIDS, tuberculosis (TB), malaria, viral hepatitis, sexually transmitted infections, and neglected tropical diseases (NTDs) are among the primary causes

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of mortality and disability.[2] In 2020, children under the age of five accounted for 77% (487.000) of all malaria deaths worldwide. In the same year, more than one billion people were treated for at least one of the five NTDs that can be prevented, controlled, or eliminated.[2] Vector-borne infections account for more than 17% of all infectious diseases, killing over 700,000 people each year. Dengue fever is the most common viral infection affects more than 3.9 billion people in 129 countries, resulting in an estimated 96 million symptomatic cases and 40,000 fatalities per year.[3] Waterborne infections affect hundreds of millions of people each year, particularly those living in underdeveloped nations without safe, accessible water. Diarrhoea is the most common symptom of waterborne illnesses. Diarrhoea is the second biggest cause of death in children under the age of five.[4]

In addition to the huge proportion of deaths and suffering they cause, communicable diseases impede social and economic growth and can represent substantial concerns to international health security.

Surveillance is the systematic collecting, analysis, and interpretation of outcome-specific data for use in the development, implementation, and evaluation of public health policies and practices. A communicable disease surveillance system performs two important roles: early warning of possible dangers to public health and program monitoring functions that can be disease-specific or multi-disease in nature.

The Integrated Disease Surveillance Programme (IDSP) is a statewide disease surveillance system in India that includes both the state and central governments. Its goal is to discover diseases early and track them over time. IDSP was launched by Hon'ble Union Minister of Health and Family Welfare in November 2004 for a period up to March 2010 with an aim to strengthen disease surveillance in the country by establishing a decentralized state-based surveillance system for epidemic-prone diseases in order to detect early warning signals and initiate timely and effective public health actions in response to health challenges in the country at the district, state, and national levels.[5] Kerala state has been included in the first phase of the national IDSP programme. The programme was launched in Kerala in November 2005.[6] Data on diseases that are prone to epidemics are collected every week (Monday through Sunday) under IDSP, which oversees data management. The project was reorganized and extended to March 2012 and was in operation during 12th Plan (2012–17) under national rural health mission (NRHM). The IDSP has faced serious obstacles over the past 15 years, including inconsistent and inadequate reporting at the grass root level, which has affected the delayed data analysis and public health interventions. India introduced the Integrated Health Information Platform), a redesigned surveillance scheme, on 1st April 2021 in an effort to address these issues; now it is real-time, case-based information and integrated analytics.

The Government of Kerala established the State Prevention of Epidemics and Infectious Diseases (PEID) cell in 1982 at Medical College Hospital Thriuvananthapuram in order to boost the state's surveillance system. Regional PEID (RPEID) cells were formed in all government medical institutions in 1989 as part of the strengthening of the PEID cell. Under RPEID cell, daily data entry is done. Though the RPEID cell started early, only with the launch of IDSP the reporting became complete and timely. It also strengthened the connection between medical colleges and state health system in collection, analysis, and sharing of information regarding communicable diseases.

This retrospective record-based cross-sectional study was done to identify the trend in communicable diseases and the pattern of mortality for a period of ten years, which will be an insight to evaluate the ongoing surveillance activities. This will help to take necessary actions for the prevention and control of communicable diseases. So this study is planned to analyse RPIED cell data from 2013 to 2022 with an aim to evaluate the trend and mortality pattern of communicable diseases in a teaching institute in Kerala.

Materials and Methods

It is a retrospective record-based cross-sectional study, after getting institutional review board clearance data collected from regional prevention of epidemic and infectious disease cell (RPEID cell) of government Medical College, Kottayam. We have an RPEID cell coordinator who is an Associate Professor and a data entry operator. Data entry operator collects the information from various departments through direct visits. Only confirmed cases are entered into the record. The collected data were cross-checked by the RPEID Cell coordinator and any disparity or confusion in diagnosis are clarified through direct discussion with physicians of respective departments. In this study, surveillance data were collected from 2013 to 2022, which are present in Excel sheets in year-wise folders in the Community Medicine department IDSP-RPEID cell official computer. These data were collected and compiled after getting permission from the head of the department and the RPEID cell coordinator. These data were grouped as airborne diseases, waterborne diseases, vector-borne disease, zoonotic diseases, bloodborne diseases, and others; COVID 19 cases were excluded. Data were entered in Microsoft Excel and analysed using SPSS software version 20. Qualitative data are expressed as frequencies/percentage and represented as tables/graphs.

Operational definitions

Airborne disease: Airborne diseases are caused by pathogenic microbes small enough to be discharged from an infected person via coughing, sneezing, laughing, and close personal contact or aerosolization of the microbe. The discharged microbes remain suspended in the air on dust particles, respiratory, and water droplets

Waterborne disease: Waterborne diseases are the ones caused by pathogenic microbes spread via contaminated water.

Zoonotic disease: A zoonosis is an infectious disease that has transitioned from a vertebrate animal to a human. Zoonotic pathogens can be bacterial, viral, or parasitic and can spread to humans by direct contact with domestic, agricultural, or wild animals or through food and water.

Vector-borne disease: Vector-borne diseases are human illnesses caused by parasites, viruses, and bacteria that are transmitted by vectors.

Bloodborne diseases: Diseases included are Hepatitis B and C

Others: Probable cases (dengue, malaria, leptospirosis, enteric fever), short febrile illness, pyrexia of unknown origin, and methicillin-resistant Staphylococcal aureus are included under others.

Results

Morbidity pattern

According to the surveillance data, from 2013 to 2022, there were 48124 patients with various infectious diseases. Communicable diseases were divided into groups such as airborne diseases, vector-borne diseases, waterborne diseases, bloodborne diseases, zoonosis, and others. COVID-19 was excluded from analysis. Among the 48124 reported cases, majority of the morbidity was due to airborne infection (37%) and the least by bloodborne diseases (2%) [Figure 1].

The maximum number of cases were reported in 2017 following which there is a decrease. The number of cases reported in 2020 was the least in the last decade, as the focus was on COVID-19. Airborne and waterborne diseases show a decreasing trend from 2018 to 2021. Zoonotic diseases show an upward trend when comparing the decadal data [Table 1].
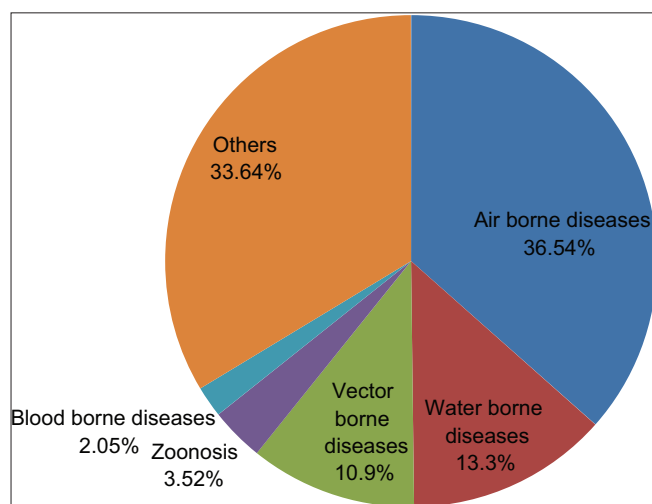

Figure 1: Distribution of communicable diseases from 2013 to 2022 (*n* = 48124)

Table 1: Year wise distribution of communicable diseases reported from 2013 to 2022 (n=48124)

Types of communicable disease	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Airborne diseases	2040 (11.6%)	1886 (10.7%)	1800 (10.2%)	2007 (11.4%)	2672 (15.2%)	2104 (12%)	1931 (11%)	969 (5.5%)	994 (5.7%)	1182 (6.7%)	17585
Waterborne diseases	420 (6.6%)	647 (10.2%)	619 (9.7%)	589 (9.2%)	580 (9.1%)	1036 (16.2%)	1189 (18.6%)	493 (7.7%)	343 (45.4%)	465 (7.3%)	6381
Vector-borne diseases	1204 (22.8%)	214 (4.1%)	497 (9.4%)	882 (16.7%)	628 (11.9%)	346 (6.6%)	439 (8.3%)	426 (8.1%)	257 (4.8%)	387 (7.3%)	5280
Zoonosis	63 (3.7%)	82 (4.9%)	101 (6%)	90 (5.3%)	88 (5.2%)	168 (9.9%)	163 (9.6%)	295 (17.4%)	365 (21.5%)	279 (16.5%)	1694
Bloodborne diseases	116 (11.7%)	96 (9.7%)	98 (9.9%)	70 (7.1%)	62 (6.3%)	108 (10.9%)	120 (12.1%)	68 (6.8%)	38 (3.8%)	215 (21.7%)	991
Others	1961 (12.1%)	873 (5.4%)	870 (5.4%)	1858 (11.5%)	2367 (14.6%)	1735 (10.7%)	1524 (9.4%)	819 (5.1%)	2187 (13.5%)	1999 (12.3%)	16193
Total	5804 (12.1%)	3798 (7.9%)	3985 (8.3%)	5496 (11.4%)	6397 (13.3%)	5497 (11.4%)	5366 (11.4%)	3070 (6.4%)	4184 (8.7%)	4527 (9.4%)	48124

Among the airborne diseases TB constituted the highest proportion in almost all years from 2013 to 2022. Waterborne cases remained stable over the decade except for an increase in 2018 and 2019. Acute diarrheal disease (ADD) showed an upward trend in the number of cases reported till 2019 and less in the last three years. The number of ADD cases were highest in 2018 and 2019 when the state of Kerala was badly affected by flood. Thereafter it shows a decreasing pattern. While looking into the seasonality of ADD, we could not identify any pattern [Figure 2]. Dengue and malaria cause the highest morbidity among vector-borne diseases. Malaria shows a decreasing pattern from 2013 to 2021. Leptospirosis is one zoonosis with an increase in trend in the last decade. Twenty-one cases of rabies reported in the surveillance period [Table 2]. All types of communicable diseases show a decreasing trend in the last five years except zoonotic diseases, which shows prompt surveillance and actions [Table 3].

Mortality pattern

There were 1842 deaths among individuals with communicable diseases throughout the time period. Airborne diseases constituted the most 690 (37.4%) deaths. The mortality pattern of airborne diseases showed an upward trend till 2018 thereafter decreased. Among 17585 airborne disease cases, 690 deaths were reported. Pneumonia cases reported showed rise till 2019 thereafter it is constant. There was a spike in H1N1 cases in 2015 and 2019. Case fatality rates were highest among zoonotic diseases (20.2%) followed by bloodborne diseases (10.2%). Waterborne diseases and vector-borne diseases constituted the least [Table 4]. There was a rise in the number of deaths from 2014 to 2018, thereafter a fall [Figure 3].

Discussion

Communicable diseases are still a major public health problem. The number of communicable diseases reported shows a consistency throughout the last decade except 2020 which was similar to Azhar *et al.*'s findings.[7] Airborne diseases show the highest morbidity among communicable diseases, which is consistent with the result of Manjula *et al.*[8] Airborne diseases were constant throughout the period except 2020 and 2021. This might be due to the COVID-19 pandemic-related lock down and other restrictions. Enteric fever and cholera cases had a decrease in trend, which was similar to V.S *et al.*'s findings.[9]

Highest morbidity was reported from airborne diseases (37%) followed by waterborne (13%) and vector-borne diseases (11%) [Table 1]. Among vector-borne diseases, dengue and malaria caused the maximum morbidity, both showed a decadal decreasing pattern which is consistent with the findings of Rajan MP *et al.*[10]

Zoonotoc diseases (leptospirosis and rabies) have the highest case fatality rate followed by bloodborne diseases. Leptospirosis is a major public health problem which is endemic in some tropical regions.[11] It contributes the highest to zoonosis and it is in an increasing pace in the past decade particularly after 2017, i.e. during flood and post-flood years. It contradicted to Rameela Sanya *et al.*'s[12] result, where the maximum number reported was in 2014. The mortality pattern of zoonosis shows a decreasing trend after 2017.

While considering bloodborne diseases, even though studies conducted by Dr. Giriyan DSS *et al.* show a decreasing trend in Hepatitis B as a major bloodborne infection in India, but this study revealed a varying trend throughout the decade.[13] The mortality pattern of blood born disease is also varying.

Limitations

As the analysis is based on secondary data reported to RPEID cell, Community Medicine some of the data were missing especially in the early years of the decade. The effect of comorbidity on mortality is not accounted for this study.

Conclusion

Even if it is the era of epidemiologic transition communicable disease is still a major public health problem in India. Airborne
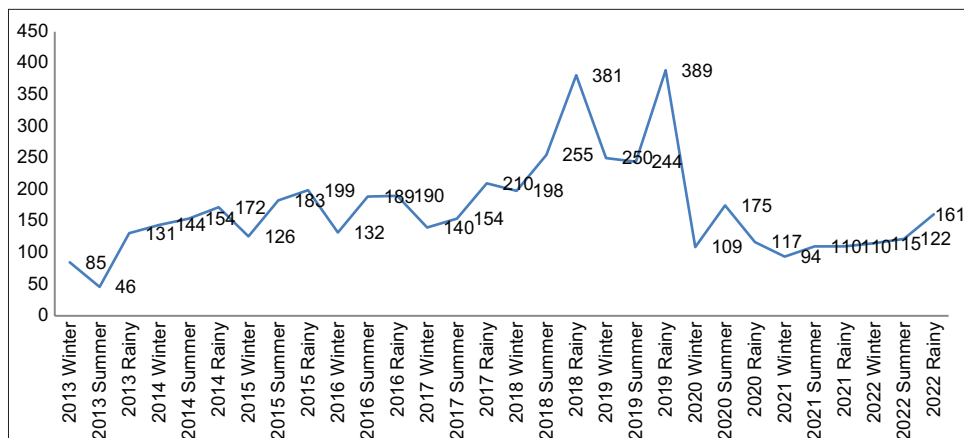

Figure 2: Seasonal distribution of ADD from 2013 to 2022. *Winter season – November, December, January. Summer season – February, March, April, May, Rainy season – June, July, August, September, October

Table 2: Pattern of specific communicable diseases from 2013 to 2022 (n=21572)

Diseases	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
TB	583 (9%)	782 (12%)	819 (12.6%)	692 (10.7%)	711 (10.9%)	742 (11.4%)	627 (9.6%)	478 (7.4%)	523 (8%)	547 (8.4%)	6504
H1N1	0 (0%)	0 (0%)	39 (42.9%)	1 (1.1%)	4 (4.4%)	9 (9.9%)	38 (41.7%)	0 (0%)	0 (0%)	0 (0%)	91
Pneumonia	19 (0.7%)	7 (0.3%)	7 (0.3%)	216 (8.2%)	335 (12.7%)	524 (19.8%)	577 (21.8%)	241 (9.1%)	308 (11.7)	408 (15.4%)	2642
ADD	262 (5.2%)	470 (9.2%)	508 (10%)	511 (10%)	504 (9.9%)	834 (16.4%)	883 (17.4%)	401 (7.9%)	314 (6.2%)	398 (7.8%)	5085
Enteric Fever	29 (29.9%)	18 (18.5%)	12 (12.4%)	5 (5.1%)	3 (3.1%)	6 (6.2%)	9 (9.3%)	7 (7.2%)	2 (2.1%)	6 (6.2%)	97
Cholera	4 (50%)	2 (25%)	0 (0%)	0 (0%)	1 (12.5%)	1 (12.5%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	8
Shigella	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (60%)	1 (20%)	0 (0%)	0 (0%)	1 (20%)	5
Dengue Fever	1156 (27.2%)	162 (3.8%)	430 (10.1%)	832 (19.5%)	571 (13.4%)	214 (5.1%)	272 (6.4%)	284 (6.7%)	113 (2.6%)	223 (5.2%)	4257
Malaria	47 (13.9%)	46 (13.7%)	65 (19.3%)	48 (14.2%)	34 (10.1%)	27 (8%)	25 (7.4%)	7 (2.1%)	5 (1.5%)	33 (9.8%)	337
Leptospirosis	60 (3.6%)	77 (4.6%)	100 (6%)	90 (5.4%)	87 (5.2%)	163 (9.7%)	161 (9.6%)	294 (17.6%)	364 (21.75%)	277 (16.5%)0	1673
Rabies	3 (14.2%)	5 (23.8%)	1 (4.8%)	0 (0%)	1 (4.8%)	5 (23.8%)	2 (9.5%)	1 (4.8%)	1 (4.8%)	2 (9.5%)	21
Viral Hepatitis B	112 (12.3%)	89 (9.8%)	89 (9.7%)	61 (6.7%)	60 (6.6%)	103 (11.3%)	113 (12.4%)	66 (7.2%)	38 (4.2%)	181 (19.8%)	852

Table 3: Mortality trend of communicable diseases (n=1842)

| Types of Diseases	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Airborne diseases	40 (5.8%)	30 (4.3%)	53 (7.7%)	49 (7.1%)	86 (12.5%)	208 (30.1%)	110 (15.9%)	18 (2.6%)	26 (3.8%)	70 (10.2%)	690
Waterborne diseases	11 (14.5%)	6 (7.9%)	5 (6.6%)	4 (5.3%)	6 (7.9%)	14 (18.4%)	9 (11.8%)	2 (2.6%)	10 (13.2%)	9 (11.8%)	76
Vector-borne diseases	39 (41.1%)	3 (3.2%)	11 (11.6%)	6 (6.3%)	14 (14.7%)	3 (3.2%)	4 (4.2%)	5 (5.2%)	6 (6.3%)	4 (4.2%)	95
Zoonosis	71 (20.8%)	64 (18.7%)	49 (14.3%)	34 (9.9%)	62 (18.1%)	18 (5.3%)	4 (1.2%)	10 (2.9%)	18 (5.3%)	12 (3.5%)	342
Bloodborne diseases	12 (11.9%)	7 (6.9%)	6 (5.9%)	12 (11.9%)	6 (5.9%)	19 (18.8%)	10 (9.9%)	11 (10.9%)	1 (1%)	17 (16.8%)	101
Others	24 (4.5%)	15 (2.8%)	14 (2.6%)	35 (6.5%)	41 (7.6%)	139 (25.8%)	64 (11.9%)	67 (12.5%)	78 (14.5%)	61 (11.3%)	538
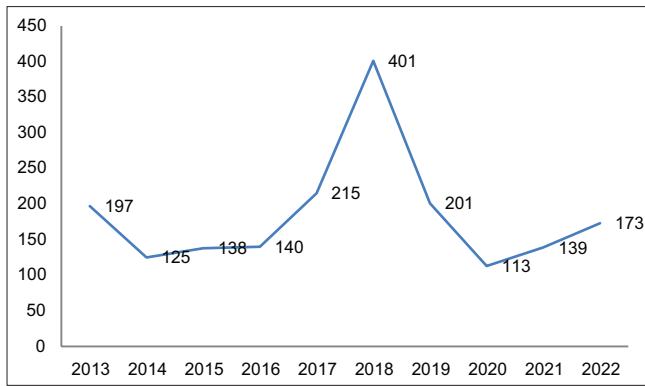
Figure 3: Mortality from communicable disease from 2013 to 2018

Table 4: Case fatality rate of communicable diseases

Type of diseases	Total cases	Total deaths	Case fatality rate
Airborne diseases	17585 (36.54%)	690 (37.4%)	3.9
Waterborne diseases	6381 (13.3%)	76 (4.1%)	1.2
Vector-borne diseases	5280 (10.9%)	95 (5.2%)	1.8
Zoonotic diseases	1694 (3.52%)	342 (18.6%)	20.2
Bloodborne diseases	991 (2.05%)	101 (5.5%)	10.2
Others	16193 (33.64%)	538 (29.2%)	3.3
Total	48124	1842	3.8

disease contributes the highest to morbidity followed by waterborne disease. TB and pneumonia cases were the major contributors of airborne disease, and dengue among vector-borne disease. Airborne disease and zoonosis contributed maximum to mortality. Among zoonosis, leptospirosis showed an increasing trend and it also contributed the highest to the mortality due to zoonosis. Case fatality rate was the highest for zoonotic and bloodborne disease. Surveillance of communicable diseases is the key to understand the trend and early warning signs of an epidemic, which in turn leads to the reduction in morbidity and mortality. The current study gave an insight into the trend in morbidity and mortality patterns of communicable diseases reported under IDSP in the last decade.

Ethical approval

Institutional Ethics Committee clearance obtained (IRB No. 279/2023).

Abbreviation	Definition
YLD	Years of healthy Life lost to Disability
DALY	Disability Adjusted Life Years
WHO	World Health Organisation
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immuno Deficiency Syndrome
TB	Tuberculosis
NTD	Neglected Tropical Disease
RPEID cell	Regional Prevention of Epidemic and Infectious Disease cell
IDSP	Integrated Disease Surveillance Programme
ADD	Acute Diarrheal Disease
NRHM	National Rural Health Mission

Conflicts of interest

There are no conflicts of interest.

References

1. The unfinished agenda of communicable diseases among children and adolescents before the COVID-19 pandemic, 1990–2019: A systematic analysis of the Global Burden of Disease Study 2019. Lancet 2023;402:313-35.

2. Our work: Communicable and noncommunicable diseases, and mental health. Available from: https://www.who.int/our-work/communicable-and-noncommunicable-diseases-and-mental-health. [Last accessed on 2023 Aug 01].

3. Vector-borne diseases. Available from: https://www.who.int/news-room/fact-sheets/detail/vector-borne-diseases. [Last accessed on 2023 Jul 31].

4. Kahn C. 7 Most Common Waterborne Diseases (and How to Prevent Them). Lifewater International. 2019. Available from: https://lifewater.org/blog/7-most-common-waterborne-diseases-and-how-to-prevent-them/. [Last accessed on 2023 Aug 01].

5. About IDSP : Integrated Disease Surveillance Programme (IDSP). Available from: https://idsp.mohfw.gov.in/index4.php?lang=1&level=0&linkid=313&lid=1592. [Last accessed on 2023 Aug 01].

6. Integrated Disease Surveillance Project (IDSP), Epidemiological Situation of Communicable Diseases in Kerala (2006 -2010). Available from: https://dhs.kerala.gov.in/wp-content/uploads/2020/06/part 1.pdf. [Last accessed on 2023 Sep 26].

7. Azhar SM, Nair AS, Devi S, Jacob J, Jose S. Trends in pattern of communicable diseases during COVID-19 lockdown in Kerala. J Family Med Prim Care 2021;10:2720-1.

8. Manjula V, Bhaskar A, Sobha A. Surveillance of communicable disease from a tertiary care teaching hospital of central Kerala, India. Int J Med Public Health 2015;5:317.

9. V S, Raj J, R AKK. Trends in water borne diseases in Kerala: An analysis of directorate of health services portal data. Int J Res Med Sci 2021;9:2381-8.

10. Rajan MP, Areekal B, Nellampani R. Trend and mortality pattern of communicable diseases in a tertiary care hospital in Kerala. Int J Community Med Public Health 2022;9:4054-9.

11. Haake DA, Levett PN. Leptospirosis in humans. Curr Top Microbiol Immunol 2015;387:65-97.

12. Sanya R, Kumaran JA. Trends of leptospirosis cases in a tertiary care center in Northern Kerala during January 2013 to October 2019. Int J Community Med Public Health 2020;7:3397-402.

13. Giriyan DSS, Nirala DNK, Agrawal DA, Bajpai DR. Seroprevalence and trend of Hepatitis B virus infection among the blood donors of North Karnataka: A nine year study. Trop J Pathol Microbiol 2017;3:248-53.